Digital payments and women's decision-making: Evidence from China

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Abstract

This study focuses on the effect of digital payments on women's decision-making power in China, using the difference-in-difference model on cross-sectional data. The results suggest that the adoption of digital payments significantly increases women's decision-making power, as the decision-making score increases more in regions with higher levels of digital payments. The effects are found to be larger for women with off-farm jobs and from households with incomes above the median. In terms of potential mechanisms, women's perceptions of self-confidence and gender equality will increase with the adoption of digital payments, thereby increasing decision-making power.

JEL classification: D15; O10; O33
Keywords: Digital payments; Women’s decision-making power; Differences-in-differences; Intra-household bargaining; Financial Inclusion

1. Introduction

The use of digital payments promotes financial inclusion by providing a wide range of positive benefits far beyond convenience (Findex). Digital payments are cheaper and safer than receiving payments in cash (Jack and Suri, 2014; Lee et al., 2021), and recipients also spent less time collecting payments. Account holders, especially women, can enjoy greater security and privacy for their transactions and have more say over their income and resources, which can increase their bargaining power and change the family consumption decisions (Field et al., 2021; Prina, 2015). According to collective family decision model (Browning et al., 2010) briefly introduced in Appendix 2, digital payments can be a distribution factor that affects women’s intra-household decision-making or bargaining power.

Figure 1 shows the trend of account adoption and digital payments in China from 2011 to 2021. In China, 82% percent of adults use digital merchant payments till 2021, far above the average share of other developing countries. Thus, it is worth studying how digital payments affect people in China, which will shed light on other developing countries in the future. Previous studies mainly focus on the effect of digital payments on consumption (Zhang et al., 2022; Zhao et al, 2022; Liu et al., 2020), yet few of them paid attention to the intra-household effect of digital payments, especially for women. To fill this gap, this paper investigates the effect of digital payments on the decision-making power of women in Chinese households. The hypotheses are:

H1: Use of digital payments improves women’s decision power in Chinese households.

H2: The impact of digital payments on decision-making power is heterogeneous across job types and household income.

H3: The effects are mediated by women’s perceptions on self-confidence and gender equality.

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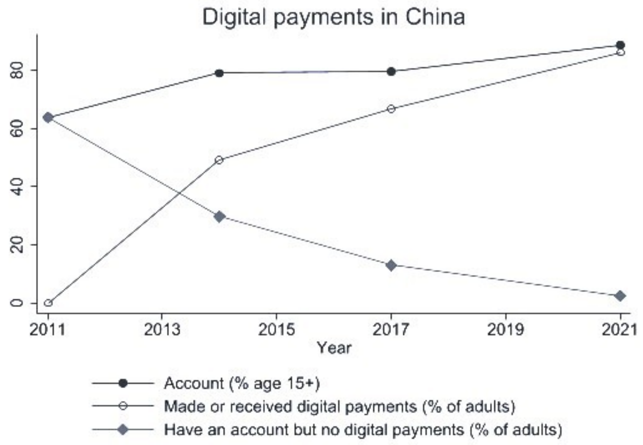

Figure 1. Digital payments in China, 2011-2021.
Source: The Global Findex Database 2021, World Bank Group

2. Data and Methodology

In this study, we use the data of year 2017 from China General Social Survey, matched with The Peking University Digital Financial Inclusion Index of China (PKU_DFII). PKU_DFII, described in Table A1, is constructed using back-end transaction data from Alipay, the largest digital financial platform in China (Guo et al., 2020). For the measurement of digital payment use level of each province, we adopt the one of the sub-indexes of PKU_DFII: payment, the magnitude of which can reflect the frequency and amount of digital payment use per capita and the ratio of high frequency digital payment users.

As for the decision-making power, we follow Kochar et al. (2022) and measure women's decision-making power based on their answers to the specific question in CGSS 2017: "How much of the distribution of household expenses is up to you?" The five options (1 = none; 2 = a little; 3 = some; 4 = most; 5 = all) are ranked in terms of an increasing role for women, so that a higher mean score reflects greater involvement in household decision-making.

For identification strategy, we follow Duflo (2001) and Kochar et al. (2022), and others who use cross-sectional variation in program intensity to identify program effects through difference-in-difference regressions. We make use of two crucial sources of variation in the use of digital payment: one of the sources of variation exploited is the effect on the decision-making before and after usage of digital payment, and other is the disparity of effects across provinces with different level in digital payment. The difference in these differences can be interpreted as the causal effect of the digital payment use, under the assumption that in the absence of the digital payment, the increase in decision-making power would not have been systematically different in low- and high-level provinces. This controls for possible endogenous variation in payment level caused by factors such as better economic conditions and more digital infrastructure. This strategy can be generalized to a regression framework:

$$wdms_{ij}=\beta_0+\beta_1 P_i+\beta_2\left(L_j P_i\right)+\beta_3\left(C_j P_i\right)+p_j+\varepsilon_{ij} \quad (1)$$

Where $wdms_{ij}$ is the decision-making score of female individual i living in province j, P_j is a dummy indicating whether this woman uses digital payment, p_j is province fixed effect, L_j

denotes the level of digital payment in province j, and C_j is a vector of region-specific variables. β_2 represents how much of an uptick in decision-making ability does a higher level of provincial digital payment bring to women who use it, compared to a lower level.

Besides, we also include other regression framework, which can add more robustness to the baseline results from a personal behavior of digital payment adoption perspective:

$$wdms_{ij}=\alpha_0+\alpha_1 P_i+\alpha_2 high_j+\alpha_3(P_i\times high_j)+\alpha_4 X_i+u_{ij} \quad (2)$$

Where L_j is replaced by a dummy variable $high_j$, representing whether province j has a payment level above the median value, and X_i represents a set of personal, family and provincial control variables. An α_3 significantly greater than 0 means women benefit more in the adoption of digital payment in the high payment level provinces. The summary statistics of the main variables are listed in Table 1.

Table 1. Summary Statistics

Variables	Definition	Mean	SD	Min	Max
Wdms	Women's decision-making power	3.73	0.92	1.00	5.00
Payment level	Provincial digital payment level	246.63	36.19	181.72	316.53
Use	Dummy of use of digital payment use	0.33	0.47	0.00	1.00
High	Dummy of high digital payment level of provinces, above median = 1, below median = 2	0.47	0.50	0.00	1.00
Ln(income)	Ln value of income	9.95	1.33	4.38	16.12
Education	Year of education	8.44	4.92	0.00	16.00
First marriage	Women's age at their first marriage	23.66	4.47	0.00	67.00
Participation in medical insurance	Dummy of Participation in medical insurance, participation = 1, non-participation = 0	0.93	0.25	0.00	1.00
Participation in pension insurance	Dummy of Participation in pension insurance, participation = 1, non-participation = 0	0.74	0.44	0.00	1.00
Spouse education	Spouse's year of education	8.86	4.47	0.00	16.00
Hukou	Residence area, rural=1, urban=0	0.63	0.48	0.00	1.00
Self-confidence score	Score reflecting perceptions of self-confidence, 1-6 from lowest to highest	4.04	1.07	1.00	6.00
Gender equality	Score reflecting perceptions on gender equality, 1-7 from lowest to highest	3.80	1.44	1.00	7.00

Children number	The number of children under 18	1.70	1.36	0.00	32.00
Ln(family)	Ln value of family income	10.63	1.24	1.95	16.12
DFI	Aggregate digital financial inclusion index	239.30	24.19	200.38	286.37
CPI	Consumer price index of each province	101.88	0.50	101.10	103.20
Disposable income	Disposable income per capita in each province	27824.02	12583.38	14670	54305
Breadth	Sub-index of ADFI for coverage breadth	218.86	32.76	177.73	285.65
Insurance	Indicator of ADFI for insurance	519.32	49.45	434.02	615.25
Credit	Indicator of ADFI for credit	158.33	18.61	111.11	190.79

3. Results and Discussion

3.1 Effect of digital payment on women's decision-making score

We first test the baseline regression framework and report the results in Table 2, where Column 1-4 for Eq. (1). In Column 1, the specification controls only for the use cohort dummy and the interaction with payment level of provinces, and then other control variables and province fixed effect are taken into specification in Column 2-3. In Column 4, we use ordered probit regression for robustness since the decision-making score is ordinal. The results suggest per 100 units the payment level of a province rises significantly increases the decision-making score of women who use digital payment by around 1. Column 5-7 are results of Eq. (2), without and with additional control variables, from which we find that compared to women in low payment level increase 0.131 in decision-making score by using digital payment, the decision-making scores of women in high level provinces increase 0.386, and 193.7% more than the former. The results only change slightly when using ordered probit regression in Column 7. It is worth noting that in Columns 5-7, women without digital payments in provinces with high payment levels have lower decision scores. This can be explained by the purpose of digital financial inclusion, which is to enable people who are excluded from traditional finance and tend to be more economically vulnerable. Therefore, the government is likely to pay more attention to provinces with more vulnerable groups by installing more digital infrastructure and implementing more support programs, leading to higher digital payment level.

Table 2. OLS and order probit results of baseline regression

Dependent Variable: Women's decision-making power	(1)	(2)	(3)	(4)	(5)	(6)	(7)
	OLS			Ordered Probit	OLS		Ordered Probit
Payment level × Use	0.00008	0.0111***	0.00913***	0.0141***	-	-	
	(0.0005)	(0.00255)	(0.00337)	(0.00313)			
High × Use	-	-	-		0.155*	0.255**	0.298**

					(0.0806)	(0.0922)	(0.116)
Use	-0.0624	11.02*	13.80*	12.62*	0.203***	0.131*	0.152*
	(0.126)	(6.195)	(7.920)	(7.566)	(0.0527)	(0.0699)	(0.0859)
High	-	-	-		-0.193	-0.575***	-0.682***
					(0.137)	(0.168)	(0.209)
Control variables	No	Yes	Yes	Yes	No	Yes	Yes
Province fixed effect	No	No	Yes	Yes	-	-	-
Sample size	8248	5953	5953	5,752	8248	5953	5,953

Note: Robust standard errors in parentheses. ***Significant at 1% level, **Significant at 5% level, *Significant at 10% level. Additional controls for Columns 1-4 include individual, family and provincial controls, and interactions of digital payment use and provincial characteristics.

3.2 Validity test

In this section, we report the results of a series of internal validity tests. To corroborate the common trend, we use an alternative measure of women's decision-making power determined before the introduction of digital payment: age at marriage, which is widely used to reflect women's bargaining power in marriage. As in Table 3 Column 1, the two cohorts in provinces with different payment levels do not have pre-trend differences in decision-making power as indicated by age at first marriage.

For falsification tests, we first consider "ineffective treatments": replacing digital payment with participation in health and pension insurance, two of the traditional financial services, in the interaction terms of the independent and control variables. Moreover, provinces with a higher level of digital payments may also be provinces that differ in terms of other development indicators. To address this, in Column 4 we report regressions that interact digital payment with female literacy. From Columns 2-4, we see that these treatments have no effect on the results. We then also test for "unaffected outcomes" in Columns 5-6 and find that the effect of the interaction term is insignificant for outcomes that should not be affected, including the number of real estate properties and the number of children under 18.

Taken together, the results of the common trends and the extensive set of falsification tests strengthen the robustness of the methodology, and the coefficient of the interaction term in equations (1) and (2) can be interpreted as the effect of digital payments on women's decision-making power.

Table 3. Results of common test and falsification tests

	(1)	(2)	(3)	(4)	(5)	(6)
Dependent Variable	Age at first marriage	Health insurance	Pension insurance	Decision-making score（Female literacy）	Number of properties	Children under 18
Payment level × Use	0.00486	0.00422	-0.00274	0.157	0.0196	0.00210
	(0.00313)	(0.00585)	(0.00363)	(0.345)	(0.0383)	(0.00190)

High × Use	-0.0361	-0.230	0.0164	-0.103	-0.0955	0.0800
	(0.400)	(0.276)	(0.121)	(0.107)	(0.126)	(0.103)
Control variables	Yes					
Province fixed effect	Yes					
Sample size	5953	5953	5953	5953	5953	5953

Note: Robust standard errors in parentheses. ***Significant at 1% level, **Significant at 5% level, *Significant at 10% level.

3.3 Heterogeneity

Next, we examine treatment heterogeneity across job types and household income in order to know whether digital financial services (digital payment in this paper) affect women inclusively. From Columns 1-3 we look at women in different types of jobs and find that women with off-farm jobs benefit the most from digital payment, then women with farm jobs, and the women unemployed benefit the least. Then, for households with different incomes, we examine two cohorts below and above the median value in Column 4-5. The results show that although the decision-making score of women in two cohorts increases significantly due to digital payment, women in households with income above median value benefit more. Thus, the promotion of digital payment increases women's decision-making power in general, and especially for women with off-farm jobs and in high-income households.

Table 4. Heterogeneity results across job types and household income

	(1)	(2)	(3)	(4)	(5)
Dependent Variable: Women's decision-making score	Off-farm job	Farm job	Unemployed	Household income below median	Household income above median
Payment level × Use	0.0149***	0.0920*	0.00750	0.00682*	0.0287***
	(0.00466)	(0.0498)	(0.00646)	(0.00391)	(0.00748)
Control variables	Yes				
Province fixed effect	Yes				
Sample size	1,897	1,080	2,775	4,856	1,422

Note: Robust standard errors in parentheses. ***Significant at 1% level, **Significant at 5% level, *Significant at 10% level.

3.4 Potential mechanisms

There are a few more distribution factors that can function as mediators and will be affected by digital payment and hence affect women's decision-making and bargaining power in households. According to Agarwal (1997), women's better control over assets will enhance sense of economic security and self-confidence, change the social perceptions about deservedness and prevailing norms, and therefore negotiating ability. In CGSS 2017, there are several questions regarding self-confidence and gender equality perceptions. We take means and generate two variables on score of self-confidence and gender equality perception, and the mediation effects are presented in Table 5. We can see that women in higher level provinces are more self-confident and supportive for gender equality, and both mediators have significant effects on women's decision-making score. The direct effects of digital payment both become smaller compared to baseline results when added the mediators.

Table 5. Results of potential mechanisms: self-confidence and gender equality perception

Dependent Variable	(1) Self-confidence score	(2) Women's decision-making score	(3) Gender equality perception score	(4) Women's decision-making score
Payment Level × Use	0.0259***	0.00749**	0.0141***	0.00860**
	(0.00380)	(0.00340)	(0.00494)	(0.00336)
Self-Confidence score	-	0.0349*** (0.0119)	-	-
Gender equality perception score	-	-	-	0.0415*** (0.00899)
Control variables	Yes			
Province fixed effect	Yes			
Sample size	5635	5607	5765	5738

Note: Robust standard errors in parentheses. ***Significant at 1% level, **Significant at 5% level, *Significant at 10% level.

4. Conclusions

In this study, the relationship between digital payment and women's decision-making power is studied. As one specific type of digital financial inclusive service, purpose of which is to improve the situation of people who are excluded by traditional finance, digital payment is supposed to improve women's bargaining and decision-making power in households where women are more vulnerable compared to their spouses. We confirm the positive effect of digital payment on women's decision-making power by a difference-in-difference strategy applied to a general comprehensive dataset, and the results are robust under a series of common and falsification tests. Besides, we also find that women in households with off-farm jobs and in high-income households benefit the most by using digital payment. The potential mechanism is the enhancement of self-confidence and gender equality perceptions. In all, digital payment significantly improves the decision-making power of women in Chinese households, from which we suggest that policymakers should continue to promote policies and actions related to digital financial inclusion.

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Appendix

1. Table

Table A1. The construction of PKU-DFII

Sub-index	Indicators	
Extensive usage	Alipay account coverage	Number of Alipay accounts per 10,000 persons
		Ratio of accounts with credit card linkage
		Average number of linked debit and credit cards per Alipay account
Intensive usage	Payment	Frequency of payments per capita
		Amount of payments per capita
		Ratio of high frequency users
	Money funds	Number of Yu’e Bao purchases per capita
		Amount of Yu’e Bao purchases per capita
		Number of Alipay users purchasing Yu’e Bao per 10,000
	Lending	Number of Internet consumer loans per 10,000 adult Alipay users
		Number of loans per capita
		Amount of loans per capita
		Number of accounts with micro enterprise credit per 10,000 accounts
		Number of loans per micro entrepreneurs
		Amount of loans per micro entrepreneurs
	Insurance	Number of accounts with insurance per 10,000

		accounts
		Number of insurance schemes participated per capita
		Amount of insurance per capita
	Investment	Number of accounts with investments per 10,000 accounts
		Number of investments per capita
		Amount of investment per capita
	Credit	Number of calls per natural person credit
		Number of users using credit-based services per 10,000 Alipay users

2. Collective family decision-making framework

According to Browning et al. (2014), the basic framework of collective family decision-making model is as follows:

For any given vector (P, p, x, z), of which P is *N*-vector for *N* public goods and p is an *n*-vector for *n* private goods, x is total expenditure and z represents the vector of distribution factors, an allocation of market purchase of public goods Q and private goods q of family member a and b (Q, q^a, q^b) is Pareto efficient if there exists a feasible $\overline{u}^a$, which may depend on (P, p, x, z), such that (Q, q^a, q^b) solves the problem:

$$\max_{Q, q^a, q^b} u^b\left(Q, q^a, q^b\right)$$

$$subject¿ P^{'}Q + p'\left(q^a + q^b\right) \leq x$$

$$¿ u^a\left(Q, q^a, q^b\right) \geq \overline{u}^a(P, p, x, z)$$

Under the assumption that the utility function is strictly concave, we can rewrite this problem using an always-nonnegative Lagrange multiplier μ:

$$\max \mu u^a\left(Q, q^a, q^b\right) + u^b\left(Q, q^a, q^b\right)$$

Where the coefficient μ is known as the Pareto weight, and has a natural interpretation of respective decision powers. If adopting a strictly concave cardinality of individual utilities, then μ is also a well defined function of F, p, x and z. Thus, there exists a function $\mu(P, p, x, z)$ such that the household solves:

$$\max \mu(P, p, x, z)\, u^a\left(Q, q^a, q^b\right) + u^b\left(Q, q^a, q^b\right)$$

So, if one distribution factor that can affect $\mu(P, p, x, z)$, it will affect the decision power of family member *a*, which in the context of this article will be women in households.